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of geometry teaching. The philosophy and the methods set forth in it are those of the author's own class-room. He believes that a pupil learns more of the subject when it is presented as in these pages, and he is certain that every pupil who is taught by this method under the guidance of a teacher who is himself interested in his subject becomes inspired to learn and is willing to work to learn. An awakening of a love of the subject is a service that may be rendered to our pupils of every intellectual grade. The text is so arranged that it may be variously used. . . . A short course . . . A laboratory course . . . A complete course . . . Exercises . . . For exceptional pupils . . . Dedication: The conception of this work runs far back in the years. It is the author's contribution in the service of his profession. It is dedicated to all those many students of the grand old science, . . . , and to all those teachers who have keenly felt the need of a more sympathetic interpretation of its immortal truths.

"In the hope that it will influence better teaching and learning, and will help to upbuild and uphold a generation which will reverence our beloved geometry for its own sake, as well as for its uses inseparable from a great constructive civilization—the author sends this little volume forth upon its mission."

*Introduction to Ballistics.*<sup>1</sup> [By ALBERT A. BENNETT.] Washington, Ordnance Department, U. S. Army, 1921. 8vo. 259 + 23 pages. Price \$1.35.

Contents—Preface, 1–2; § 1: General remarks, 3–5; § 2: Some elementary concepts in mechanics, 6–25; § 3: Some elements of interior ballistics, 26–41; § 4: An introductory discussion of exterior ballistics, 41–46; § 5: The equations of the trajectory in vacuo, 46–53; § 6: Action of air resistance, 53–68; § 7: Measurements of air resistance, 69–72; § 8: Tabulation of air resistance, 73–77; § 9: The ballistic coefficient, 78–82; § 10: The trajectory in air, 83–85; § 11: Elements of the trajectory, 85–98; § 12: Siacci's method, 99–110; § 13: The use of Ingalls' Tables II, 111–117; § 14: Ballistic tables based on numerical integration, 118–131; § 15: The computation of trajectories by numerical integration, 131–139; § 16: Deviation of the trajectory from the plane of fire, 140–147; § 17: Errors and the application of the theory of probability, 148–168; § 18: Range table conditions, 169–183; § 19: Variations from range table conditions, 184–188; § 20: Differences in altitude of gun and target, 189–198; § 21: Wind effects, 198–210; § 22: Meteorological changes, 211–217; § 23: Rotation of the earth, 218–227; § 24: The meteorological message, 228–238; § 25: Proving Ground data, 239–244; § 26: Range tables, 245–258; Table of contents, 259. Supplement: Comparative sketch of the normal ballistic coefficient, 1–23.

*A Course in Exterior Ballistics. Ordnance Textbook.* [By R. S. HOAR.] Washington, Government Printing Office, 1921. 8vo. 127 pages. Price \$1.00.

Extracts from the Introduction—"The work of the ballistic computer is divided into three parts: (1) the computation of the elements of standard trajectories; (2) the computation of differential corrections, whereby the elements of a standard trajectory may be corrected for nonstandard conditions; and (3) the utilization of the foregoing to construct range tables from firing records. . . . The first course of instruction in these new ballistic methods ever given in this country was given at the Ordnance School of Application in the winter of 1919–20 by Capt. Roger Sherman Hoar, Coast Artillery, then in charge of the Ballistic Section of the Proof Department at Aberdeen. This present book is based upon the papers used in that course, and uses the standard symbology and nomenclature established as above. It is assumed that the student is thoroughly grounded in algebra and plane trigonometry, and knows enough calculus to appreciate the meaning of a derivative, a differential, and a definite integral. On that basis, this book gives, in Chapters I to IV, the irreducible minimum of higher mathematics necessary to understand all points involved in the later chapters."

Contents—Introduction, 7–9; Chapter I: Partial differentiation, 10–13; II: Successive approximations, 14–17; III: Effect of differential variations, 18–27; IV: Finite differences, 28–33; V: Elements of the trajectory, 34–37; VI: History of exterior ballistics, 38–42; VII: The motion of a projectile, 43–46; VIII: Computation of trajectories, 47–52; IX: Derivation of auxiliary variables, 53–58; X: Range correction formulas, 59–69; XI: Angle of departure correc-

<sup>1</sup> For notice of *Physical Bases of Ballistic Table Computation* by Professor Bennett see this MONTHLY, 1920, 372.

tion formulas, 70-72; XII: Deflection formulas, 73-75; XIII: Rotation of the earth, 76-82; XIV: Computation of differential corrections, 83-90; XV: Weighting factors, 91-95; XVI: Construction of a range table, 96-102; Supplement A: Trajectory computation by the tangent reciprocal method, 103-104; B: Explanation of the signs in the computation of differential corrections, 105-106; C: Dimensions of ballistic symbols, 107-108; D: Antiaircraft fire, 109-110; E: Derivation of two equations of Chapter VII, 111-113; F: A derivation of Theorem I, 114-115; G: New methods of trajectory computation, 116-119; H: Note on advancing difference formulas, 120-121; Index, 123-127.

#### NOTES.

The third volume of *Fundamenta Mathematicae* (see 1921, 318) appeared in April. It contains 323 pages, consisting of 29 papers + problems proposed and lists of exchanges. The only American authors are R. L. MOORE, "Concerning connectedness im kleinen and a related property," 232-237, and J. R. KLINE, "A theorem concerning connected point sets," 238-239.

Volumes 85 and 86 of *Mathematische Annalen* (see 1921, 135) have been published. The following articles are by American writers—In volume 85: A. J. KEMPNER, "Über die Separation komplexer Wurzeln algebraischer Gleichungen," 49-59; E. R. HEDRICK and W. D. A. WESTFALL, "The existence domain of implicit functions," 74-77; E. J. WILCZYNSKI, "Charakteristische Eigenschaften der isothermkonjugierten Kurvennetze," 208-212; E. KASNER, "The solar gravitational field completely determined by its light rays," 227-236. In volume 86: O. D. KELLOGG, "On the existence and closure of sets of characteristic functions," 14-17; E. H. MOORE, "On power series in general analysis," 30-39.

A. Hermann, 6 rue de la Sorbonne, Paris, is offering for sale the volumes in the mathematical libraries of Monsieur Lebon and Professor Camille Jordan, and Professor Pierre Boutroux.

The mathematical library of the late Paul Mansion (d. 1919), long professor of mathematics at the University of Ghent, is to be presented to the University of Louvain as soon as a library building has been erected. One of Professor Mansion's sons is a professor at the University of Louvain, and another is professor at the University of Liège.

In accordance with the terms of the Treaty, volumes from the various libraries of Germany are now being assembled at Leipzig for the University of Louvain. The ruins of the old L-shaped library still stand much as after the fire. The corner stone of the building for the great new library was laid July 28, 1921, and work on the foundations is now being carried on. The inscription on the corner stone is: "Lapis primarius Bibliothecae Lovaniensis nobiliter reficiendæ."

#### ARTICLES IN CURRENT PERIODICALS.

**AMERICAN JOURNAL OF MATHEMATICS**, volume 43, October, 1921: "On some properties of general manifolds relating to Einstein's theory of gravitation" by J. A. Schouten and D. J. Struik, 213-216; "Geometrical theorems on Einstein's cosmological equations" by E. Kasner, 217-221; "On the Fermat and Hessian points for the non-euclidean triangle and their analogues for the tetrahedron" by C. M. Sparrow, 222-225; "The Cauchy-Lipschitz method for infinite systems of differential equations" by W. L. Hart, 226-231; "Boundary value and expansion problems; formulation of various transcendental problems" by R. D. Carmichael, 232-270; "Reciprocity in a problem of relative maxima and minima" by J. K. Whittemore, 271-290.